N O T I C E

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GUIDANCE BULLETIN

This Guidance Bulletin will be automatically removed from the Notice web page 60 days from its issued date and will become a permanent attachment to LIG 402-600-01, Electrical Safety Implementation Guide, on that date.

Equipment Grounding Conductor Verification & Testing On Cord-and-Plug Connected Equipment

Background

A technician working near a 480Y/277 volt 3-phase welder was shocked on May 27, 2003, when his elbow contacted the welder cart as he was operating a grounded bandsaw. The plug connection of the welder had recently been incorrectly wired so that the green-insulated or bare copper equipment-grounding conductor was connected to one of the energized phases. The installer had been distracted because of being assigned multiple concurrent jobs and the wiring had not been checked or verified prior to being put into service. This resulted in the welder frame and cart being at a nominal 277 volts, relative to ground. The mis-wired electrical welder was an imminent danger electrical hazard, waiting for someone to touch it who also was touching a grounded object, completing the circuit path. This situation could have resulted in a severe shock or electrocution.

The Service Support Subcontractor (KSL) suspended the energization or re-energization of electrical systems immediately when this was discovered. After establishing a verification and testing procedure and documentation, KSL lifted the suspension and craft workers were re-authorized to complete electrical jobs with an assurance that wiring and other completed electrical work is safe for customers to use, operate, or occupy.

Heads Up

The electrical hazard involved in the described incident could apply to many electrical systems that have external or exposed metal parts, whether the system or equipment is programmatic R&D equipment or facility equipment. Since permanently installed facility equipment usually has hard connections to the equipment grounding system, the hazard is more likely to occur on cord-and-plug connected equipment. Because we all

rely on the individuals who wire electrical equipment to have performed it correctly, qualified electrical workers who wire systems or equipment need to review and understand the value of checking their work and having another qualified electrical worker verify it as correct.

Lessons Learned Tips

- Verification and testing of equipment grounding conductor connections should be done visually and with a test meter to check for continuity.
- Workers may be distracted when assigned multiple concurrent tasks.
- Work interruptions involving the need to do something differently may be a flag to pause and re-review the work, its hazards and controls.
- For reference, Notice No. 0108 (Electrical Safety Bulletin No. 7) indicated:
  - "When ESOs commission or approve electrical equipment, measure the continuity of case to its ground prong before plugging it in."
  - "Failure to confirm chassis to building ground connection can result in electrical shock."

Roles and Responsibilities

1. Managers, supervisors, and qualified electrical workers should incorporate required details of verification and testing of equipment grounding into procedures, e.g., AHA, work ticket, SOP, SEWP, or HCP.

2. Visual checking and continuity testing with a meter should be done by the qualified and authorized worker, whether craft or programmatic, on completion of electrical jobs on cord-and-plug connected equipment to assure that the completed work operates and performs as intended, and that it is safe for use. This check/test especially applies to metal parts that are intended to be grounded, such as equipment grounding conductor (EGC) terminations from the power plug to the connected equipment.

3. A second person, as the qualified and authorized verifier, can also check and test equipment operation and grounding at the completion of electrical jobs.

Questions? Contact: Group or Division ESO
Chief ESO 665-7377 or e-mail to **tfogle@lanl.gov**

Los Alamos NATIONAL LABORATORY

The OIC for this notice is HSR-5 / Electrical Safety Committee (ESC), and the responsible division director is HSR-DO. This notice will automatically become an attachment to LIG 402-600-01, Electrical Safety Implementation Guide, in 60 days.